PhytoKeys

PhytoKeys 267: 23–35 (2025)
DOI: 10.3897/phytokeys.267.157814

Research Article

Paraphlomis leigongshanensis (Lamiaceae), a new species from Guizhou, China

Wei-Hao Yao[1], Guo-Bin Jiang[1], De-Hui Yu[2], Sheng Chen[3], Hong-Mei Chen[1], Li Dai[1], Bai-Qiu He[4], He Li[1]

1 *Key Laboratory of National Forestry and Grassland Administration on Biodiversity Conservation in Karst Mountainous Areas of Southwestern China, Guizhou Academy of Forestry, Guiyang, 550005, China*
2 *Guizhou Leigong Mountain National Nature Reserve Administration, Leishan, 557100, China*
3 *Institute of Biology, Guizhou Academy of Sciences, Guiyang, 550009, China*
4 *College of Life Sciences, University of Chinese Academy of Sciences, Beijing, 100049, China*

Corresponding author: Guo-Bin Jiang (1606580765@qq.com)

Abstract

Paraphlomis leigongshanensis G.B. Jiang & W.H. Yao (Lamiaceae), a new species endemic to Leigong Mountain National Nature Reserve (Guizhou, China), is described and illustrated. Morphologically, it is most similar to *P. jiangyongensis*, but can easy be distinguished by its lamina shape, calyx teeth shape, and corolla color. A close relationship between the new species and *P. gracilis* var. *lutienensis* was revealed by molecular phylogenetic analyses based on ETS and ITS sequences, but they are morphologically distinct from each other. With only three known populations (ca. 200 mature individuals) in subtropical evergreen forests, the new species is assessed as Endangered (EN) under IUCN criteria B2ab(iii); D.

Key words: Guizhou, Lamioideae, new taxon, phylogenetic analyses

OPEN ACCESS

Academic editor: Chun-Lei Xiang
Received: 4 May 2025
Accepted: 13 October 2025
Published: 2 December 2025

Citation: Yao W-H, Jiang G-B, Yu D-H, Chen S, Chen H-M, Dai L, He B-Q, Li H (2025) *Paraphlomis leigongshanensis* (Lamiaceae), a new species from Guizhou, China. PhytoKeys 267: 23–35. https://doi.org/10.3897/phytokeys.267.157814

Copyright: © Wei-Hao Yao et al.
This is an open access article distributed under terms of the Creative Commons Attribution License (Attribution 4.0 International – CC BY 4.0).

Introduction

Paraphlomis (Prain) Prain (Lamiaceae, Lamioideae) is a member of the tribe Paraphlomideae Bendiksby, which was established to accommodate *Paraphlomis*, *Matsumurella* Makino, and *Ajugoides* Makino based on molecular phylogenetic evidence (Bendiksby et al. 2011; Zhao et al. 2021). Most species of *Paraphlomis* are distributed in southern China, with several taxa extending into the Himalayas, Korea, and Southeast Asia (Wu and Li 1977; Li and Hedge 1994a; Ko et al. 2014; Chen et al. 2021). Previous molecular phylogenetic studies revealed that *Paraphlomis* was not monophyletic, as species of *Matsumurella* were nested within it (Chen et al. 2021, 2022a; Guo et al. 2023). Recently, Yuan et al. (2024) treated *Matsumurella* and *Ajugoides* as synonyms of *Paraphlomis* based on plastome data and nuclear ribosomal DNA (nrDNA) sequences, as well as morphological evidence. Morphologically, *Paraphlomis* is characterized by its rhizomatous or stoloniferous habit, plants with simple hairs, nutlets with a truncate apex, and actinomorphic calyces (Wu and Li 1977; Bendiksby et al. 2011; Chen et al. 2021; Yuan et al. 2024). According to the Catalogue of Life China 2025 Annual Checklist and recent references, *Paraphlomis*

comprises 51 species and six varieties (Li and Hedge 1994a; Chen et al. 2021; Yuan et al. 2024, 2025; Liu et al. 2025).

During a botanical field survey in Leigong Mountain National Nature Reserve, Guizhou Province, in 2024, we discovered an unknown species of *Paraphlomis*. This species is distinguished by its dwarf habit, a white corolla with pink stripes, and hairy mericarps. After careful field observations, morphological comparisons with other members of *Paraphlomis*, and molecular phylogenetic analyses, we confirmed its specific status and taxonomic placement within the genus. We hereby named it as *P. leigongshanensis* G.B. Jiang & W.H. Yao.

Materials and methods

Morphological study

During February 2024 and July 2025, four field surveys were carried out at the type locality of the new species. Specimens from several herbaria were examined, including GYBG, GZTM, HGAS, HIB, IBK, IBSC, KUN, NAS, and PE (herbarium abbreviations follow the conventions outlined by Thiers (2025)). Additionally, we consulted several online databases, including the China Plant Photography Database (http://ppbc.iplant.cn/), the Chinese Field Herbarium (http://www.cfh.ac.cn/), and Global Plants (http://plants.jstor.org/), to obtain supplementary information on species distributions and morphological data. To distinguish the new species from other species of *Paraphlomis*, we conducted detailed morphological comparisons, focusing on key characteristics such as stems, leaves, calyx, corolla, mericarps, and trichomes. All measurements were made using a dissecting microscope. The morphological description followed relevant taxonomic and floristic literature on *Paraphlomis*, with terminology standardized according to Li and Hedge (1994b), ensuring consistent and accurate morphological interpretation.

Molecular phylogenetic analyses

For the molecular phylogenetic reconstruction of *Paraphlomis*, we included a total of 53 samples: 38 representing *Paraphlomis* taxa (34 species and four varieties) and two outgroup taxa. The outgroups comprised *Phlomoides dentosa* var. *glabrescens* (Danguy) C.L. Xiang & H. Peng and *Phlomis fruticosa* L. Only one accession of the new species was sampled and sequenced in this study, while sequence data for other species were obtained from GenBank and previous studies (Chen et al. 2021, 2022a, 2022b).

Genomic DNA was extracted from dried leaf tissue using a modified CTAB method (Doyle and Doyle 1987). Previous studies have shown that phylogenetic trees based on nuclear ribosomal DNA internal and external transcribed spacers (nrITS and nrETS) offer more effective insights into the phylogenetic relationships of *Paraphlomis* than those constructed using chloroplast DNA (Chen et al. 2021; Yuan et al. 2024). Thus, only the nrDNA data was used here for phylogenetic reconstruction. Voucher information and GenBank accession numbers for all sequences are provided in Appendix 1.

The best-fitting substitution model was selected using the Akaike Information Criterion (AIC) based on sequence data in jModelTest v.2.1.7 (Darriba et al. 2012). Phylogenetic analyses were performed using Bayesian Inference (BI)

and Maximum Likelihood (ML) methods, employing MrBayes (Ronquist et al. 2012) and RAxML v.8.2.9 (Stamatakis 2014) on the CIPRES Science Gateway v.3.3 (Miller et al. 2010), respectively. The Markov chain Monte Carlo algorithm was run for 20 million generations with four incrementally heated chains starting from random trees and sampling one out of every 1,000 generations. The initial 25% of sampled trees were discarded as burn-in and the 50% majority-rule consensus tree was calculated from remaining trees with nodal support summarized as posterior probabilities (PP). All phylogenetic trees were visualized and edited for clarity using FigTree v.1.4.2 (Rambaut 2014), with PP and bootstrap support (BS) values annotated on the branches.

Results and discussion

Morphological comparison

Morphological comparisons were based on an examination of 196 specimens representing 14 species of *Paraphlomis*. A key diagnostic character of the potential new species *P. leigongshanensis* is the hairy mericarps, which serves as an important taxonomic feature for the infrageneric classification (Chen et al. 2021; Yuan et al. 2024). Morphologically, *P. leigongshanensis* is most similar to *P. jiangyongensis* in the dwarf habit ascending stems, and hairy mericarps (Table 1). However, it differs from *P. jiangyongensis* by its abaxially purple (vs. green) laminae, calyx teeth acuminate (vs. acute) at apex, and longer corolla tubes. Additionally, the corolla of *P. leigongshanensis* is white with pink stripes and spots, with the markings concentrated on the lower lip, differing from the pale yellow corolla lips with red spots in *P. jiangyongensis*. This species is distributed in the mid-subtropical evergreen broad-leaved forests in Leishan County, Guizhou, exhibiting geographical isolation from *P. jiangyongensis* (Appendix 2: Fig. A1).

Molecular phylogenetic analyses

The concatenated nrDNA dataset had a total length of 1259 bp, comprising 814 bp from the ITS region and 445 bp from the ETS region. The dataset contained 356 variable sites (168 from ITS, 188 from ETS) and 205 parsimony-informative characters (89 from ITS, 116 from ETS).

The resulting phylogenetic tree of *Paraphlomis* was consistent with previous studies (Chen et al. 2021; Yuan et al. 2024). The potential new species *P. leigongshanensis* was resolved as sister to *P. gracilis* var. *lutienensis* (Y. Z. Sun) C. Y. Wu (Fig. 1: BS = 100%/PP = 1.00), and the *P. leigongshanensis*–*P. gracilis* var. *lutienensis* clade was further sister to *P. gracilis* var. *gracilis* Kudô (Fig. 1: BS = 100% / PP = 1.00). The three taxa were all nested within the "Clade III" proposed by Chen et al. (2021) and Yuan et al. (2024) (Fig. 1: BS = 83%/PP = 1.00). Species in this clade (highlighted in blue in Fig. 1) are all characterized by hairy mericarps (Chen et al. 2021; Yuan et al. 2024). Despite the close relationships and geographical affinities (Appendix 2: Fig. A1) among *P. leigongshanensis*, *P. gracilis* var. *gracilis*, and *P. gracilis* var. *lutienensis*, *P. leigongshanensis* is morphologically distinct from the latter two taxa. Specifically, *P. leigongshanensis* exhibits a creeping habit with stems 5–10 cm tall, ovate to elliptic leaves, reddish-purple calyces, sessile flowers, and white corollas with pink stripes and spots. In contrast, *P. gracilis* var. *gracilis*

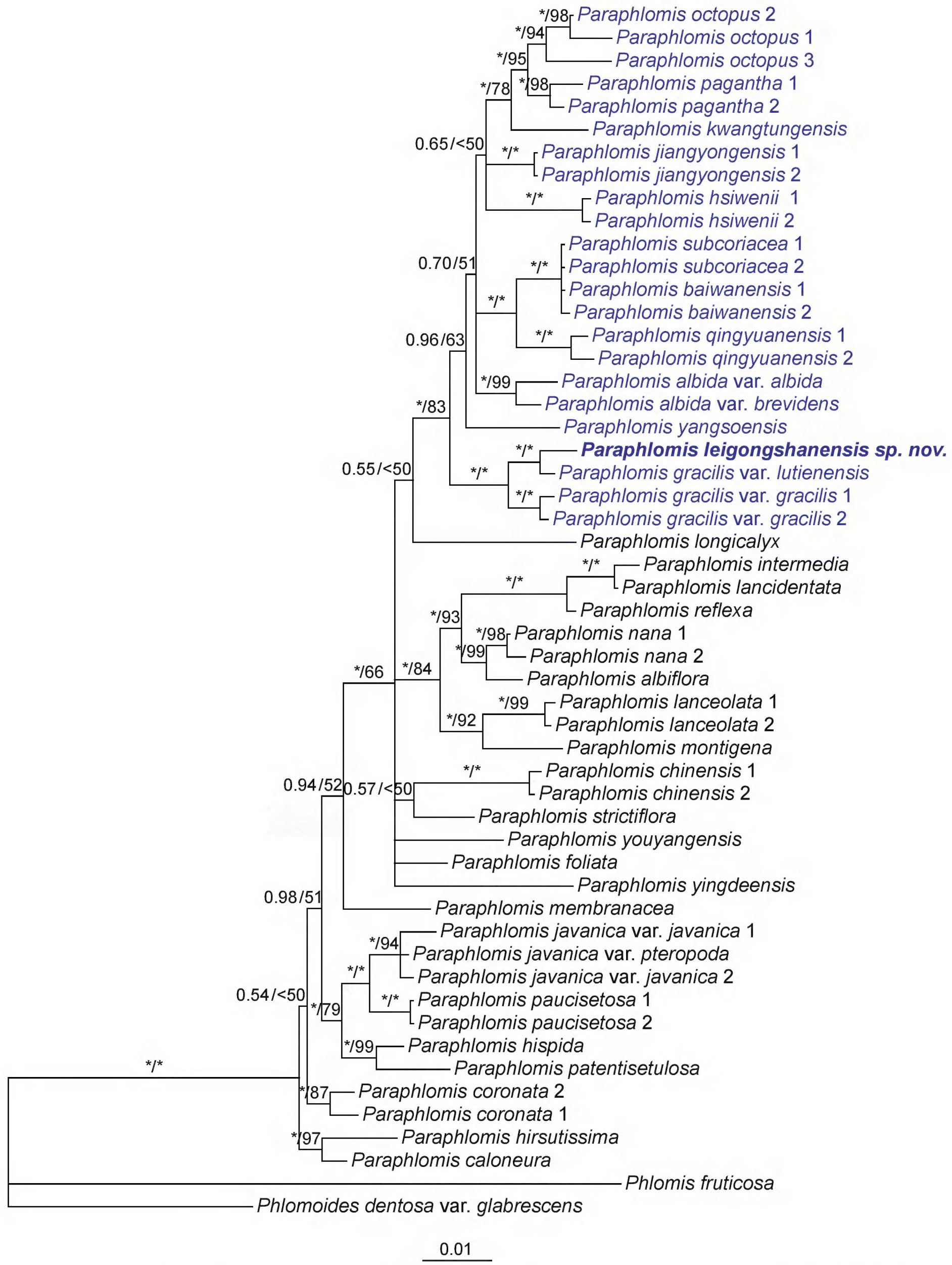

Figure 1. Bayesian 50% majority-rule consensus tree of *Paraphlomis* based on combined nuclear (ITS and ETS) data set. Support values ≥ 0.50 PP or 50% BS are displayed above the branches (an "*" indicates a support value of 1.00 PP or 100% BS). Multiple accessions of the same species are numbered according to Appendix 1

has erect and much taller stems (up to 1 m tall), lanceolate leaves, green calyces, subsessile flowers, and yellowish green to white corollas with purple spots (Table 1). *Paraphlomis gracilis* var. *lutienensis* differs from both species by its subsessile and narrowly lanceolate laminae and yellow corollas. Moreover, a recent phylogenetic study based on plastome data (Yuan et al. 2024) indicated that the phylogenetic relationship between *P. gracilis* var. *gracilis* and *P. gracilis* var. *lutienensis* is consistent with the results of our study. Based on our phylogenetic results, although *P. leigongshanensis* is grouped with *P. gracilis* var. *gracilis* and *P. gracilis* var. *lutienensis*, there is sufficient evidence to support its recognition as a distinct species. The morphological differences further reinforce its taxonomic distinctiveness and provide additional support for its designation as a new species.

Table 1. Morphological comparisons among *P. leigongshanensis*, *P. jiangyongensis*, *P. gracilis* var. *gracilis,* and *P. gracilis* var. *lutienensis*.

Character	*P. leigongshanensis*	*P. jiangyongensis*	*P. gracilis* var. *gracilis*	*P. gracilis* var. *lutienensis*
Stem	Prostrate to ascending, 5–10 cm tall	Ascending, 5–30 cm tall	Erect, 30–100 cm tall	Erect, 30–100 cm tall
Lamina	Ovate to long elliptic, 2.5–7 × 2–5 cm, abaxially purple, densely villose	Ovate to subcircular, 3–8 × 2–5 cm, abaxially light green, densely strigose	Lanceolate, 5–10 × 1.7–3.3 cm, abaxially green, densely strigose and glandular	Lanceolate, 6.5–10.5 × 1.7–2.5 cm, abaxially green, densely strigose and glandular, subsessile and narrowly lanceolate
Verticillaster	2–10-flowered	2–8-flowered	(2–) 4–8 (–12)-flowered	(2–) 4–8 (–12)-flowered
Pedicel	Sessile	Sessile	Subsessile	Ca. 4 mm long
Calyx	Purplish–red, densely villose	Green, densely strigose	Green, densely retrorse strigose	Green, densely retrorse strigose
Calyx teeth	4–8 mm long, triangular, apex acuminate	Ca. 2 mm long, triangular, apex acute	Ca. 6 mm long, triangular, apex acuminate or subulate	Ca. 4 mm long, triangular, apex acuminate
Corolla	12–17 mm long, white lower lip with pink stripes and spots	7.5–10 mm long, pale yellow, lower lip with red spots	15 mm long, upper yellow, white or yellowish green, lower lip white with purple spots or yellow with red spots	15 mm long, yellow, lower lip with pink spots

Taxonomic treatment

Paraphlomis leigongshanensis **G.B.Jiang & W.H.Yao, sp. nov.**
urn:lsid:ipni.org:names:77365161-1
Figs 2, 3; Appendix 2: Figs A1, A2
雷公山假糙苏

Type. CHINA • Guizhou Province: Qiandongnan Miao and Dong Autonomous Prefecture, Leishan County, Leigong Mountain National Nature Reserve, 26°24'30.91"N, 108°15'53.77"E, alt. 1104 m, 23 Aug. 2024, *G.B. Jiang, S. Chen, H.M. Chen & D.H. Yu GB2024156* (holotype: GF 09040011!; isotypes: KUN 1644009!, HGAS 0128505!).

Diagnosis. *Paraphlomis leigongshanensis* is morphologically most similar to *P. jiangyongensis* but can be distinguished by its calyx purplish red (vs. green), apex of calyx teeth lanceolate (vs. acute), corolla white with pink stripes (vs. pale yellow with red spots), and corolla tube 12–17 mm long (vs. 7.5–10 mm long).

Description. Perennial herb, 5–10 cm tall, stoloniferous. ***Stems*** simple, prostrate to ascending, slightly 4-angled, densely villose. Leaves opposite, ovate to elliptical, papery, 2.5–8 × 2–5 cm; margin shallowly crenate, apex obtuse

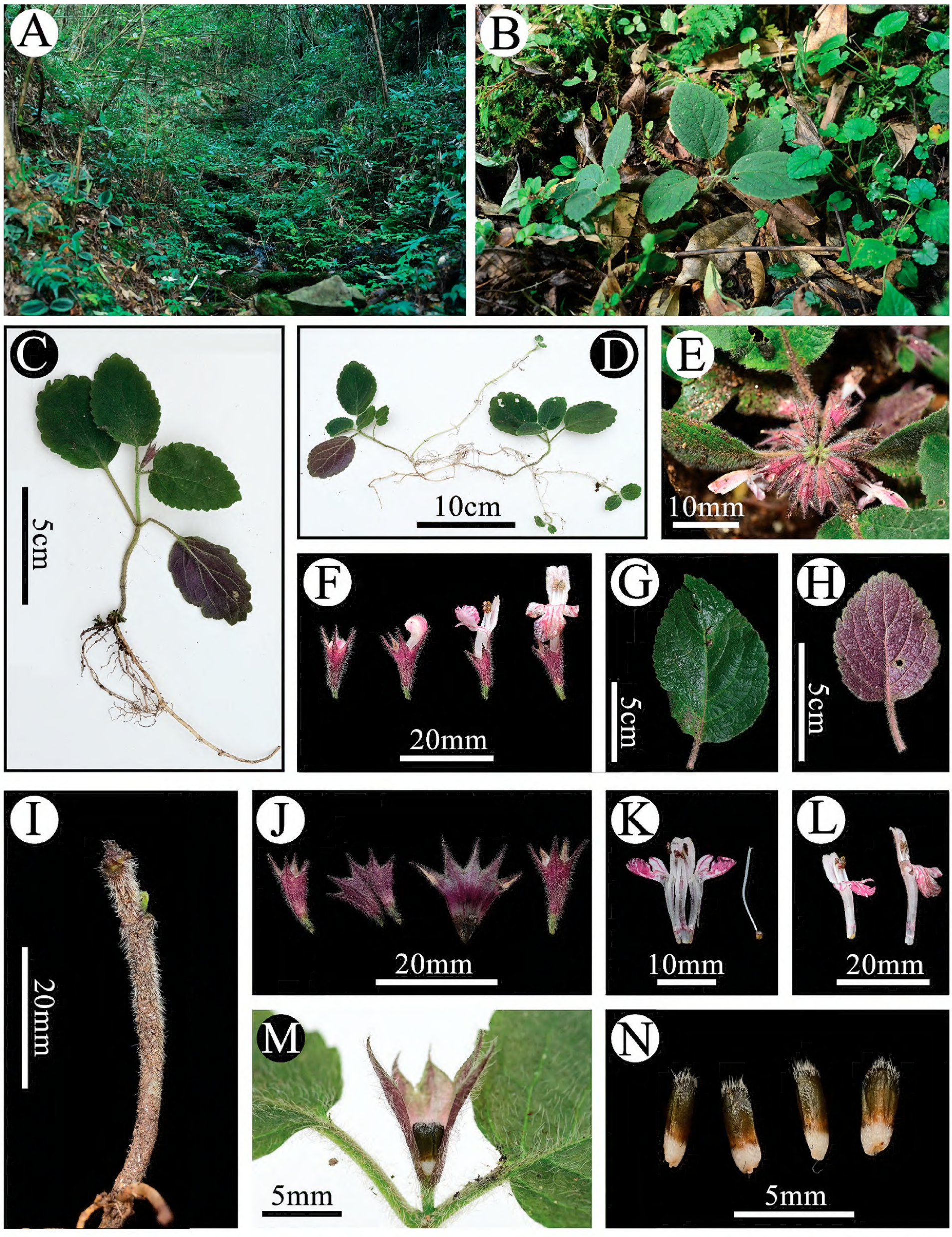

Figure 2. *Paraphlomis leigongshanensis* from the type locality. **A.** Habitat; **B-D.** Habit; **E.** Inflorescence; **F.** Flowering condition; **G.** Adaxial view of leaf; **H.** Abaxial view of leaf; **I.** Stem; **J.** Calyces; **K.** Dissected corolla and pistil; **L.** Corollas; **M.** Dissected calyx and mericarps; **N.** Dried mericarps. (Photographed by Guo-Bin Jiang).

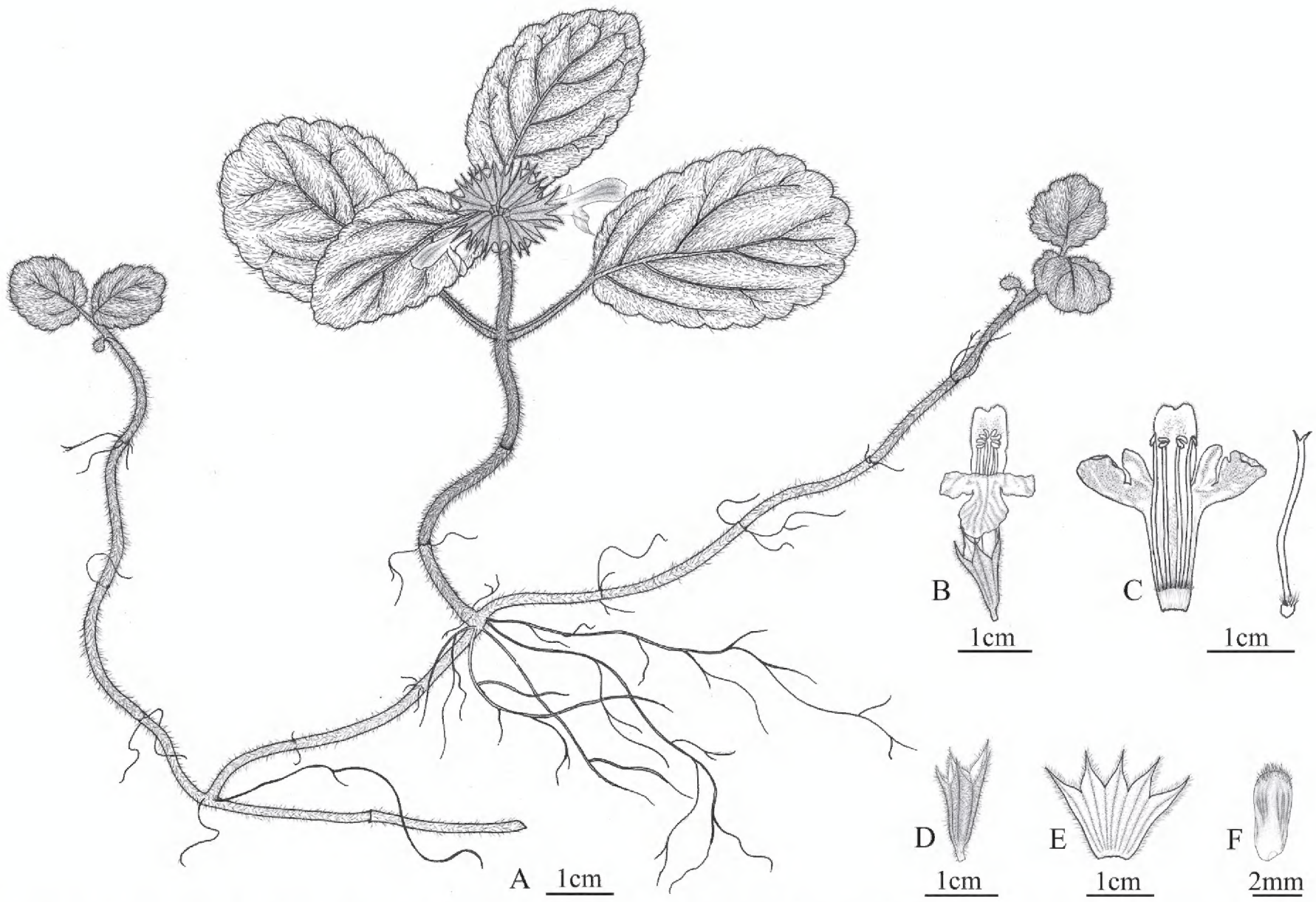

Figure 3. Line drawing of *Paraphlomis leigongshanensis*. **A.** Plant; **B.** Flower; **C.** Dissected corolla and pistil; **D.** Calyx; **E.** Dissected calyx; **F.** Nutlets. (Drawn by Hong-Mei Chen).

to subrounded, base broadly cuneate to rounded; adaxial surface green, abaxial purple, densely villose on both surfaces, particularly along veins, lateral veins 3–5-paired; petioles 0.5–3.5 cm long, densely villose. ***Verticillasters*** 2–10-flowered, sessile; bracteoles minute, early deciduous. ***Calyx*** purplish red, tubular-campanulate, 10–15 mm long, densely villose outside, glabrous inside; teeth 5, subequal, triangular, erect, 4–8 mm long, apex acuminate. ***Corolla*** white with pink stripes and spots, 2–3 cm long, densely pubescent outside; tube 1.2–1.7 cm long, slightly dilated at throat, pubescent annulate inside at 1/3 distance from base; bilabiate, upper lip pink, oblong, entire, erect, concave, 8–10 mm long, ca. 5 mm wide, lower lip pink, 3-lobed, medium lobe subcircular with pink stripes and spots, apex slightly emarginate, 6–7 mm wide, lateral lobes ovate, ca. 3.5 mm wide. ***Stamens*** 4, straight, included; filaments flat, pubescent at base; anther cells 2, parallel. ***Style*** included, glabrous, apex subequally 2-lobed, lobes subulate. ***Ovary*** densely pubescent and glandular at apex. ***Mericarps*** 4, dark brown, triquetrous-oblong, ca. 3.6 mm long, densely pubescent at apex.

Distribution, habitat and conservation status. *Paraphlomis leigongshanensis* is currently known from only three populations in adjacent valleys approximately 100 m apart, within Leigong Mountain National Nature Reserve, Guizhou, China (Appendix 2: Fig. A1). The total population comprises about 200 mature individuals. The species occurs in the subtropical monsoon climate zone, with populations confined to the area near Getou Village, and is vulnerable to anthropogenic disturbances. Based on the IUCN Red List criteria B2(a, b(iii)) (extent of occurrence

< 500 km^2; < 5 locations; continuing habitat degradation), D (Estimated population size < 250 mature individuals), we proposed an Endangered (EN) assessment (IUCN 2024). Since similar adjacent habitats may harbor undiscovered populations, available evidence did not support Critically Endangered (CR) status.

Phenology. Flowering was observed from May to August, and fruiting from August to October.

Etymology. The specific epithet "*leigongshanensis*" is derived from the type locality of the new species, i.e., Leigong Mountain National Nature Reserve, Leishan County, Guizhou Province, China.

Chinese name (assigned here). léi gōng shān jiǎ cāo sū (雷公山假糙苏). The name means a species of *Paraphlomis* only found in Leigong Mountain National Nature Reserve, Guizhou Province, China.

Additional specimens examined (paratypes). CHINA • Guizhou Province: Qiandongnan Miao and Dong Autonomous Prefecture, Leishan County, Leigong Mountain National Nature Reserve, 26°24'19.92"N, 108°15'19.20"E, alt. 1100 m, 1 Jul. 2025, *S. Chen & L. Hao GB2025015* (GF 09040012!, KUN 1644008!).

Acknowledgements

We are grateful to Dr. Ya-Ping Chen of the Kunming Institute of Botany, Chinese Academy of Sciences, for conducting the phylogenetic analysis. We thank Tao-Hua Yuan (PhD candidate, Tibet University), Xiao-Kai Xiong (Master's candidate, Guizhou University), and Jiang-Miao Gu (Master's candidate, Guizhou University) for their suggestions on the manuscript.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Use of AI

No use of AI was reported.

Funding

This study was financially supported by the Survey and Assessment of Newly Added National Key Protected Wild Plant Resources in Guizhou Province (Three stage) (MCHC-ZD20242057), Guizhou Provincial Basic Research Program (Qiankehe Fundamentals-ZK [2023] General 234), and Guizhou Provincial Basic Research Program (Qiankehe Fundamentals-MS [2025] 327).

Author contributions

Guo-Bin Jiang conceptualized and led the project. Field investigation and sample collection were conducted by Guo-Bin Jiang, Sheng Chen, De-Hui Yu, Hong-Mei Chen, Li Dai, and Wei-Hao Yao. Wei-Hao Yao, Guo-Bin Jiang, Hong-Mei Chen, and Bai-Qiu He examined and detailed the fine structure of the species represented in the study. The initial

draft of the manuscript was prepared by Wei-Hao Yao and Guo-Bin Jiang. All authors approved the final manuscript.

Author ORCIDs

Wei-Hao Yao https://orcid.org/0009-0001-8231-0867
Guo-Bin Jiang https://orcid.org/0000-0002-4631-7906
De-Hui Yu https://orcid.org/0009-0008-4264-8995
Sheng Chen https://orcid.org/0000-0002-2727-6504
Hong-Mei Chen https://orcid.org/0009-0002-2368-7813
Li Dai https://orcid.org/0009-0004-3907-8582
Bai-Qiu He https://orcid.org/0009-0009-7491-3586
He Li https://orcid.org/0009-0006-0597-3209

Data availability

The newly-obtained ITS and ETS sequences have been submitted to the NCBI (accession numbers: PV476761; PV478008). All of the other data that support the findings of this study are available in the main text.

References

Bendiksby M, Thorbek L, Scheen AC, Lindqvist C, Ryding O (2011) An updated phylogeny and classification of Lamiaceae subfamily Lamioideae. Taxon 60(2): 471–484. https://doi.org/10.1002/tax.602015

Chen YP, Liu A, Yu XL, Xiang CL (2021) A preliminary phylogenetic study of *Paraphlomis* (Lamiaceae) based on molecular and morphological evidence. Plant Diversity 43(3): 206–215. https://doi.org/10.1016/j.pld.2021.03.002

Chen YP, Xiong C, Zhou HL, Chen F, Xiang CL (2022a) *Paraphlomis nana* (Lamiaceae), a new species from Chongqing, China. Turkish Journal of Botany 46(2): 176. https://doi.org/10.55730/1300-008X.2680

Chen YP, Sun ZP, Xiao JF, Yan KJ, Xiang CL (2022b) *Paraphlomis longicalyx* (Lamiaceae), a new species from the limestone area of Guangxi and Guizhou Provinces, southern China. Systematic Botany 47(1): 251–258. https://doi.org/10.1600/036364422X16442668423572

Darriba D, Taboada GL, Doallo R, Posada D (2012) jModelTest 2: More models, new heuristics and parallel computing. Nature Methods 9: 772. https://doi.org/10.1038/nmeth.2109

Doyle JJ, Doyle JL (1987) A rapid DNA isolation procedure for small quantities of fresh leaf tissue. Phytochemical Bulletin 19: 11–15.

Guo XG, Zhao WY, Chen YP, Xiao JH, Li YQ, Fan Q (2023) *Paraphlomis yingdeensis* (Lamiaceae), a new species from Guangdong, China. PhytoKeys 219: 107–120. https://doi.org/10.3897/phytokeys.219.97547

IUCN (2024) Guidelines for Using the IUCN Red List Categories and Criteria. Version 16. Prepared by the Standards and Petitions. https://www.iucnredlist.org/documents/RedListGuidelines.pdf

Ko SC, Lee YM, Chung KS, Son DC, Nam BM, Chung GY (2014) A new species of *Paraphlomis* (Lamiaceae) from Korea: An additional genus to the Korean flora. Phytotaxa 175(1): 51–54. https://doi.org/10.11646/phytotaxa.175.1.6

Li HW, Hedge IC (1994a) *Paraphlomis*. In: Wu CY, Raven PH (Eds) Flora of China, vol. 17. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis, 170–177. https://www.iplant.cn/foc/pdf/Paraphlomis.pdf

Li HW, Hedge IC (1994b) Lamiaceae. In: Wu CY, Raven PH (Eds) Flora of China, vol. 17. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis, 269–291.

Liu A, Chen HB, Zhang F, Chen YP (2025) *Paraphlomis anisochila* (Lamiaceae), a new species from Hunan, China. PhytoKeys 259: 249–262. https://doi.org/10.3897/phytokeys.259.153345

Miller MA, Pfeiffer W, Schwartz T (2010) Creating the CIPRES Science Gateway for inference of large phylogenetic trees. 2010 Gateway Computing Environments Workshop (GCE), 8 pp. https://doi.org/10.1109/GCE.2010.5676129

Rambaut A (2014) FigTree, v.1.4.2. http://tree.bio.ed.ac.uk/software/figtree/

Ronquist F, Teslenko M, van der Mark P, Ayres DL, Darling A, Höhna S, Larget B, Liu L, Suchard MA, Huelsenbeck JP (2012) MrBayes 3.2: Efficient Bayesian phylogenetic inference and model choice across a large model space. Systematic Biology 61(3): 539–542. https://doi.org/10.1093/sysbio/sys029

Stamatakis A (2014) RAxML version 8: A tool for phylogenetic analysis and post-analysis of large phylogenies. Bioinformatics (Oxford, England) 30(9): 1312–1313. https://doi.org/10.1093/bioinformatics/btu033

Thiers BM (2025) [continuously updated] Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/science/ih/ [accessed 1 July 2025]

Wu CY, Li HW (1977) *Paraphlomis* Prain. In: Wu CY, Li HW (Eds) Flora Rei-publicae Popularis Sinicae, vol. 65(2). Science Press, Beijing, 545–572.

Yuan JC, Liu A, Takano A, Maki M, Hodel RGJ, Chen YP, Xiang CL (2024) Plastid phylogenomics with broad taxon sampling provides insights into the generic delimitation of Paraphlomideae (Lamiaceae). Taxon 73(4): 1016–1029. https://doi.org/10.1002/tax.13222

Yuan JC, Xiao JF, Xu WB, Yi SR, Xiang CL, Chen YP (2025) *Paraphlomis wui* (Lamiaceae), a new species from Chongqing, China. Kew Bulletin.

Zhao F, Chen YP, Salmaki Y, Drew BT, Wilson TC, Scheen AC, Celep F, Bräuchler C, Bendiksby M, Wang Q, Zhang MD, Peng H, Olmstead RG, Li B, Xiang CL (2021) An updated tribal classification of Lamiaceae based on plastome phylogenomics. BMC Biology 19(1): 2. https://doi.org/10.1186/s12915-020-00931-z

Appendix 1

Table A1. Sequence information for all samples used in present study. A "/" indicates a missing sequence. Herbarium abbreviations are listed after the vouchers. The accession numbers marked in bold represent sequences newly generated.

Taxon	Voucher	Country	ITS	ETS
Paraphlomis albida Hand.-Mazz. var. *albida*	A. Liu et al. LK0841 (CSFI)	Ningyuan, Hunan, China	MW602124	MW602091
Paraphlomis albida var. *brevidens* Hand.-Mazz.	Y.P. Chen EM312 (KUN)	Hezhou, Guangxi, China	MW602130	MW602098
Paraphlomis albiflora (Hemsl.) Hand.-Mazz.	C.M. Tan et al. 1806393 (JJF)	Jiujiang, Jiangxi, China	/	MW602101
Paraphlomis baiwanensis W.Y. Zhao, Y.P. Chen & Q. Fan 1	Y.S. Chen et al. QY20230302 (IBSC)	Qingyuan, Guangdong, China	PP897029	PP897950
Paraphlomis baiwanensis W.Y. Zhao, Y.P. Chen & Q. Fan 2	Q. Fan et al. 20251 (SYS)	Qingyuan, Guangdong, China	PP897030	PP897951
Paraphlomis caloneura K.J. Yan, Y.P. Chen & Y.F. Huang	W.H. Wu et al. LHT1841 (KUN)	Napo, Guangxi, China	OQ627454	OQ628080
Paraphlomis chinensis (Benth.) J.C. Yuan, Y.P. Chen & C.L. Xiang 1	Y. Yang OYY00316 (KUN)	Pingxiang, Jiangxi, China	MW602147	MW602117
Paraphlomis chinensis (Benth.) J.C. Yuan, Y.P. Chen & C.L. Xiang 2	Y. Yang OYY00131 (KUN)	Guilin, Guangxi, China	MW602148	MW602118
Paraphlomis coronata (Vaniot) Y.P. Chen & C.L. Xiang 1	E.D. Liu et al. 3043 (KUN)	Emeishan, Sichuan, China	MW602137	MW602107

Taxon	Voucher	Country	ITS	ETS
Paraphlomis coronata (Vaniot) Y.P. Chen & C.L. Xiang 2	C.L. Xiang 358 (KUN)	Jiangkou, Guizhou, China	MW602123	MW602090
Paraphlomis foliata (Dunn) C.Y. Wu & H.W. Li	S.P. Chen s.n. (KUN)	Jiangle, Fujian, China	/	MW602097
Paraphlomis gracilis (Hemsl.) Kudô var. gracilis 1	A. Liu LK0931 (CSFI)	Changsha, Hunan, China	MW602134	MW602104
Paraphlomis gracilis (Hemsl.) Kudô var. *gracilis 2*	C.L. Xiang XCL1315 (KUN)	Chongqing, China	MW602141	MW602111
Paraphlomis gracilis var. *lutienensis* (Y.Z. Sun) C.Y. Wu	C.L. Xiang XCL881 (KUN)	Shibing, Guizhou, China	MW602131	MW602099
Paraphlomis hirsutissima C.Y. Wu & H.W. Li	F. Zhao & G. Chen XCL2115 (KUN)	Malipo, Yunnan, China	OQ627453	OQ628079
Paraphlomis hispida C.Y. Wu	X. Li LX200702 (GXF)	Napo, Guangxi, China	MW602132	MW602102
Paraphlomis hsiwenii Y.P. Chen & Xiong Li 1	W.H. Wu et al. DD426 (KUN)	Jingxi, Guangxi, China	OP605346	OP609841
Paraphlomis hsiwenii Y.P. Chen & Xiong Li 2	W.H. Wu et al. DD426 (KUN)	Jingxi, Guangxi, China	OP605347	OP609842
Paraphlomis intermedia C.Y. Wu & H.W. Li	X. Zhong et al. ZX16823 (CSH)	Suichang, Zhejiang, China	MW602135	MW602105
Paraphlomis javanica (Blume) Prain var. *javanica* 1	Y.P. Chen s.n. (KUN)	Kunming, Yunnan, China	MW602121	MW602088
Paraphlomis javanica (Blume) Prain var. *javanica* 2	L.B. Jia et al. JLB0029 (KUN)	Maguan, Yunnan, China	MW602143	MW602113
Paraphlomis javanica var. *pteropoda* D. Fang & K.J. Yan	X. Li 2020090501 (GXF)	Jingxi, Guangxi, China	MW602140	MW602110
Paraphlomis jiangyongensis X.L. Yu & A. Liu 1	A. Liu et al. LK1104 (CSFI)	Jiangyong, Hunan, China	MW602128	MW602095
Paraphlomis jiangyongensis X.L. Yu & A. Liu 2	A. Liu et al. LK1104 (CSFI)	Jiangyong, Hunan, China	MW602129	MW602096
Paraphlomis kwangtungensis C.Y. Wu & H.W. Li	Q. Fan et al. 19738 (SYS)	Qujiang, Guangdong, China	PP713070	PP706067
Paraphlomis lanceolata Hand.-Mazz. 1	C.Z. Huang s.n. (KUN)	Guidong, Hunan, China	MW602145	MW602115
Paraphlomis lanceolata Hand.-Mazz. 2	A. Liu et al. LK0825 (CSFI)	Ningyuan, Hunan, China	MW602146	MW602116
Paraphlomis lancidentata Y.Z. Sun	X. Zhong et al. ZX16824 (CSH)	Suichang, Zhejiang, China	MW602136	MW602106
***Paraphlomis leigongshanensis* G.B. Jiang & W.H. Yao**	**G.B. Jiang et al. GB2024156 (GF)**	**Leishan, Guizhou, China**	**PV476761**	**PV478008**
Paraphlomis longicalyx Y.P. Chen & C.L. Xiang	Y.P. Chen et al. EM583 (KUN)	Huanjiang, Guangxi, China	OK104771	OK104774
Paraphlomis membranacea C.Y. Wu & H.W. Li	M.S. Nuraliev 1057 (MW)	Thanh Son, Phu Tho, Vietnam	/	MW602100
Paraphlomis montigena (X.H. Guo & S.B. Zhou) J.C. Yuan, Y.P. Chen & C.L. Xiang	Y.C. Dai s.n. (KUN)	Hangzhou, Zhejiang, China	OM836064	OM884453
Paraphlomis nana Y.P. Chen, C. Xiong & C.L. Xiang 1	C. Xiong XC21097 (KUN)	Chengkou, Chongqing, China	OM836062	OM884451
Paraphlomis nana Y.P. Chen, C. Xiong & C.L. Xiang 2	C. Xiong & H.L. Zhou XC21126 (KUN)	Wushan, Chongqing, China	OM836063	OM884452
Paraphlomis octopus Q. Fan, Y.P. Chen & Ying Liu 1	Y.P. Chen & Y. Zhao EM1391 (KUN)	Huaiji, Guangdong, China	MW602126	MW602093
Paraphlomis octopus Q. Fan, Y.P. Chen & Ying Liu 2	Q. Fan et al. 19752 (SYS)	Fengkai, Guangdong, China	PP713071	PP706068
Paraphlomis octopus Q. Fan, Y.P. Chen & Ying Liu 3	Q. Fan et al. 19760 (SYS)	Pingle, Guangxi, China	PP713072	PP706069
Paraphlomis pagantha Dunn 1	L.X. Yuan et al. s.n. (KUN)	Qionghai, Hainan, China	OP605345	OP609840
Paraphlomis pagantha Dunn 2	X.Y. Jiang et al. HN001 (SYS)	Wenchang, Hainan, China	PP713073	PP706070
Paraphlomis patentisetulosa C.Y. Wu	C.L. Su et al. XY015 (KUN)	Xinyi, Guangdong, China	OQ627455	OQ628081
Paraphlomis paucisetosa C.Y. Wu 1	X.X. Zhu s.n. (KUN)	Malipo, Yunnan, China	MW602125	MW602092
Paraphlomis paucisetosa C.Y. Wu 2	X. Li LX200704 (GXF)	Napo, Guangxi, China	MW602133	MW602103
Paraphlomis qingyuanensis W.Y. Zhao, R.M. Wu & Q. Fan 1	Q. Fan et al. QYK-HH-1904 (SYS)	Yingde, Guangdong, China	PP897031	PP897952
Paraphlomis qingyuanensis W.Y. Zhao, R.M. Wu & Q. Fan 2	Q. Fan et al. 20255 (SYS)	Yingde, Guangdong, China	PP897032	PP897953
Paraphlomis reflexa C.Y. Wu & H.W. Li	Z.Z. Yang et al. s.n. (HIB)	Tongshan, Hubei, China	MW602122	MW602089
Paraphlomis strictiflora J.C. Yuan, B. Chen & C.L. Xiang	B. Chen et al. CB05956 (CSH)	Yinjiang, Guizhou, China	/	OP609839
Paraphlomis subcoriacea C. Y. Wu ex H. W. Li 1	Q. Fan et al. QYK-CJ-1911 (SYS)	Yangshan, Guangdong, China	PP897033	PP897954
Paraphlomis subcoriacea C. Y. Wu ex H. W. Li 2	Q. Fan et al. QYK-LB-1920 (SYS)	Yangshan, Guangdong, China	PP897034	PP897955
Paraphlomis yangsoensis (Y.Z. Sun) J.C. Yuan, Y.P. Chen & C.L. Xiang	L. Wu & W.B. Xu 10965 (IBK)	Yangshuo, Guangxi, China	MW602142	MW602112
Paraphlomis yingdeensis W.Y. Zhao, Y.Q. Li & Q. Fan	Q. Fan et al. 19013 (SYS)	Yingde, Guangdong, China	OP605348	OP609843
Paraphlomis youyangensis H. Jiang, R.B. Zhang & Tan Deng	R.B. Zhang et al. ZRB2531 (ZY)	Youyang, Guizhou, China	OR488121	OR487461
Phlomis fruticosa L.	Y. Tong s.n. (KUN)	Shanghai, China (cultivated)	MW602119	MW602086
Phlomoides dentosa var. *glabrescens* (Danguy) C.L. Xiang & H. Peng	Y.P. Chen EM360 (KUN)	Beijing, China (cultivated)	MW602120	MW602087

Appendix 2

Supplementary figures provided in the present study.

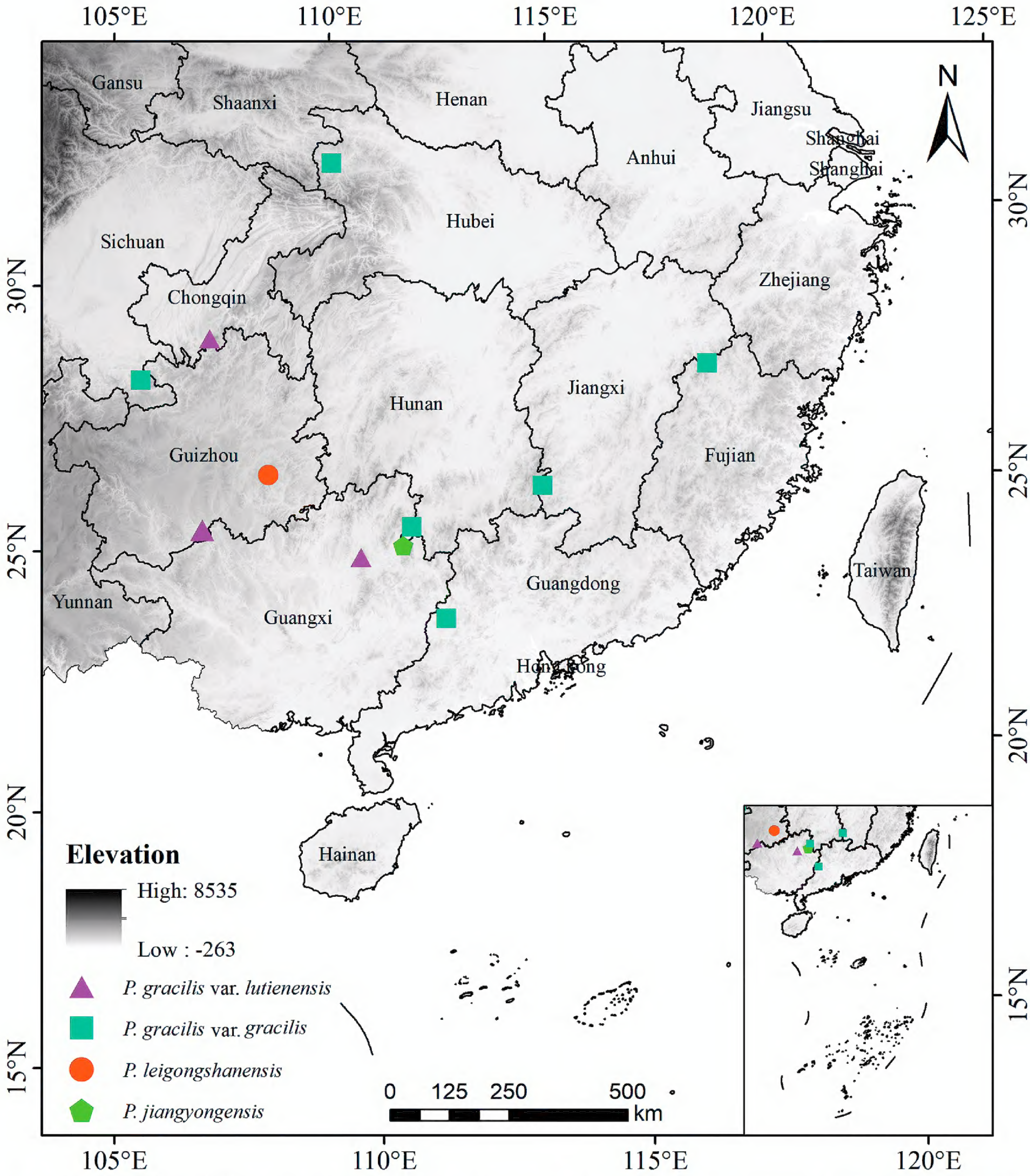

Figure A1. Distribution of *Paraphlomis leigongshanensis*, *P. jiangyongensis*, *P. gracilis* var. *gracilis*, and *P. gracilis* var. *lutienensis*.

Figure A2. Holotype (**A**) and isotype (**B**) specimens of *Paraphlomis leigongshanensis*.